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Three-Loop Calculation of the Higgs Boson Mass in Supersymmetry

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A Key feature of the minimal supersymmetric extension of the Standard Model (MSSM) is the existence of a light Higgs boson, the mass of which is not a free parameter but an observable that can be predicted from the theory. Given that the LHC is able to measure the mass of a light Higgs with very good accuracy, a lot of effort has been put into a precise theoretical prediction.

We present a calculation of the SUSY-QCD corrections to this observable to three-loop order. We perform multiple asymptotic expansions in order to deal with the multi-scale three-loop diagrams, making heavy use of computer algebra and keeping a keen eye on the numerical error introduced.

We provide a computer code in the form of a Mathematica package that combines our three-loop SUSY-QCD calculation with the literature of one- and two-loop corrections to the Higgs mass, providing a state-of-the-art prediction for this important observable.

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